

Standard Operating Procedure

Steering Positioning Pump Removal and Installation

Simba E7 C, Simba M6 C, Boomer M1 D, Boomer E2 C, Boltec E, Boltec M, Boltec EC, Cabletec LC, Cabletec M, Cabletec E



Original Instructions

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Revision History

Rev. No.	Revision Date	Description
001	September 2022	Original release
002	November 2024	SOP has been revised to add Boltec EC,E, Boomer M1D,E2C, Simba M6C,E7C applicability

1 Customer Acknowledgment

Use only Epiroc original parts. Damage or breakdown that is caused by non-original spare parts are not covered by the warranty or product liability.

Epiroc is not held responsible for damages that are caused by unauthorized modification of the machine and its associated equipment.

The manufacturer is not liable for damage that is caused by inappropriate use.

The following damages are not covered by the customer warranty policy:

- Damage from substandard repairs,
- Injury to personnel from unresolved repairs,
- Damage to equipment from unresolved repairs.

Always refer to the customer warranty policy.

Performance specifications are based on maximum computed values and are subject to revisions without notification. Nothing in this instruction extends any warranty or representation expressed or implied, regarding the products described. Any such warranties or other terms and conditions shall be in accordance with Epiroc standard terms and conditions of sale for such products, which are available upon request.

Specifications represented herein are calculated values at 100% efficiency. Epiroc is constantly striving for product improvements and enhancements. Accordingly, Epiroc reserves the right to make such changes in specifications and design as the company considers in conformity with this policy or due to unavailability of materials or assemblies.

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2 General Information

2.1 Introduction

This SOP provides an administrative control to help manage the hazards and risks of doing the task of Component Removal and Installation.

As a preface to using this SOP, all other types of controls, such as elimination, substitution, isolation, and engineering must be considered and implemented.

2.2 Qualifications / Licenses Required

THIS PROCEDURE IS ONLY FOR EPIROC-CERTIFIED TECHNICIANS.

Service technicians/workers doing this maintenance procedure must have a Technical Level 1 or Technical Level 2 certification.

This task serves numerous customer jurisdictions. If a particular procedure or clause conflicts with the site-specific requirements or a particular country's occupational health and safety standards, the responsibility rests on the user to amend those procedures or clauses, as applicable.

2.3 Terms and Abbreviations

Term	Definition
Job Safety and Environmental Analysis	Local job risk observation tool, used for job hazard identification and determination of how to manage the risk through appropriate control measures.
Technician	A person who is qualified to do the work according to local regulations and requirements.
Approved lifting device	A device that is connected to, or applied on, a component for the purpose of lifting it. The device must fulfil local regulations and requirements for the lifting operation. All lifts must be assessed and calculated by an approved person inclusive of rigging selection and placement on the load to determine the safe lifting methods that are applied.
Machine	The complete Epiroc machine that the component is located within.
Equipment	Auxiliary equipment to assist task operations, including but not limited to Lifting Devices, Compressors, Tooling.

Abbreviation	Definition
JSEA	Job Safety and Environmental Analysis
PPE	Personal Protective Equipment

2.4 Manufacturer's Information

<p>Sweden Epiroc Rock Drills AB Klerkgatan 21 Örebro, 701 91</p>	<p>USA Epiroc Drilling Solutions, LLC 2100 North First Street Garland, Texas 75040 - USA</p>
<p>India Epiroc Mining India Private Limited Phoenix Market City, Viman Nagar Pune, 411014</p>	<p>India Epiroc Mining India Private Limited 90, MIDC, Satpur Nashik, 422007</p>
<p>China Epiroc (Nanjing) Construction and Mining Equipment Limited 2, Hengtai Road Nanjing Economic and Technological Development Zone Nanjing, 210033</p>	<p>Japan Epiroc Japan K.K. 50-1, Kawawa-cho, Tsuzuki-ku Yokohama 224-0057, Japan</p>

3 Safety

3.1 Safety First

The person or persons doing the tasks contained in this document must be qualified in accordance with local regulations and requirements. It is the duty of all personnel involved in doing the tasks to read and understand the machine-specific Safety, Operation, Maintenance, and Isolation manuals and any other documentation specifically referenced in this document before starting any work on the machine.

The instructions include specific safety messages that are marked with **Danger**, **Warning**, **Caution**, **Notice**, or **Note**. Give extra attention to these messages, as they contain additional information to the instruction text. Comply with any local safety rules that are specific to the work location.

Use this instruction in conjunction with a local Job Safety and Environmental Analysis (or equivalent) to identify and manage hazards.

3.2 Job Safety and Environmental Analysis (JSEA)

Job Safety and Environmental Analysis provides job hazard identification, potential risk assessment, and suggested controls for the tasks that are described in this instruction. All persons involved in the task must create a JSEA for the job or task on the physical objects in front of them, and consider any local conditions, environmental hazards, and risks.

Remove or minimize all of the hazards that are identified before you begin work.

If hazards cannot be reduced to an acceptable level of risk, do a complete review of the site-specific JSEA.



NOTE: Refer to local or site-specific regulations and the JSEA or equivalent type of job-risk-assessment documentation.

3.3 Risk Factors

- Accidental Movements
- Heavy Components
- High-Pressure System
- Slipping Hazard
- Environmental Contaminant
- Crushing Hazard

3.4 Safety Precautions Before and During the Work

- All the persons who are involved in this task must be aware of hazards on and around the machine.
- Refer to the machine-specific safety manual.
- Disconnect the electrical power and cover exposed terminals before you work on the electrical system.

- Be careful when you attach and secure the lifting device to the individual parts and to the large assemblies being moved for replacement purposes to prevent the risk of accidents.
- Use lifting device that is in correct condition and with an adequate lifting capacity always.
- Do not work or stand below suspended loads at any time.
- Manual handling of components must be completed with close attention to correct manual handling techniques.
- Make sure that only authorized personnel operate the crane.
- Take correct measures to prevent people getting into the work area while you lift the components.
- Use the correct personal protective equipment.
- Keep your fingers out of pinch point areas when you remove and install the components.
- Release all of the pressure in the hydraulic system before you disconnect the hoses.
- Make sure that all of the hoses are connected in the same locations as they are disconnected.
- Do not let used oil drain onto the ground.
- Obey all local standards and regulations for discarding the used oil.
- Be aware of workers working below the machine.
- Wear correct head protection at all times when you work below and around the machine.
- Waste handling shall be conducted in accordance with local regulations and requirements.
- Minimize spills that occur during service. In the event of accidental spillage or leakage, collect the fluid with absorbents or some other method as dictated by the environment or a specific instruction. Handle fluids and chemicals as hazardous waste if not otherwise stated in the Material Safety Data Sheet.
- Used oils and greases shall be handled as hazardous waste.
- Discard waste fluids in an environmentally safe manner at all times.
- Refurbish replaced parts and components, if possible, and use them again. If this is not possible, recycle the part or component.
- For additional information, refer to the Epiroc loss prevention standard and the Parts and Services Division Workshop audit processes.

3.5 Personal Protective Equipment

Make sure that all necessary personal protective equipment (PPE) is available and properly used when doing this procedure, including:

- Head – Hard hat
- Ears – Hearing protection
- Eyes – Applicable glasses
- Hands – Applicable gloves
- Feet – Safety shoes with steel toes
- Safety harness – Fall protection
- Welding clothing
- Welding mask
- Face shield protection
- Safety devices

Obey to all site-specific standard PPE requirements, mandatory area PPE regulations, and any other PPE requirements identified in the risk assessment.

4 Preparations and Prerequisites

4.1 Labor Resource (People/Skills)

Service Technician x 1

Crane Operator x 1

4.2 Technical Data

To select correct lifting devices, stands, and tools, refer to the technical data as detailed throughout the instruction sections.



NOTE: Due to the variation of machine options and components, actual values can differ from data. Data is for reference only.

4.3 Machine Technical Data

See machine-specific manuals for weight, dimensions, and other data relevant to bringing the machine to the work area and doing the task.

4.4 Component Technical Data

Description	Data	Remarks
Steering positioning pump	28.89 kg (62.36 lb)	Boltec M Cabletec M Cabletec E Cabletec LC
Gear pump	3.45 kg (7.6 lb)	Boltec M Boltec E
	3.385 kg (7.46 lb)	Cabletec M Cabletec LC
	3.145 kg (6.93 lb)	Cabletec E
	5.7 kg (12.7 lb)	Boltec EC Boomer M1D Boomer E2C Simba M6C Simba E7C

4.5 Tools

Description	Specification
Standard mechanic toolkit	
Torque wrench, calibrated	½-in drive, capacity up to 69 Nm (51 ft-lb)
Tags	As required

4.6 Support Equipment

Description	Specification
Maintenance stands	As required
Crane	As required
Lifting equipment	As required
Wheel chocks	As required
Vacuum pump	As required
Container	20 L (5.29 gal)

4.7 Consumables

Description	Specification	Quantity
Plugs and caps	-	As required
Oil absorbent materials	-	As required

4.8 Spare Parts



NOTE: To create an order list request for the spare parts, refer to the Spare Parts Catalog for your specific machine model and serial number.

Description	Specification	Quantity
Steering Positioning Pump set	-	1
Gear pump	-	1
Screw	Gear pump	2
Washer		2
Screw	Steering positioning pump	4
Washer		4
O-ring		1


Description	Specification	Quantity
Screw	Flange halves	4
Washer		4

4.9 Suggested Time Required (Standard planning hours)

Ref. Section	Description	Planned Time (HH:MM)
5,6,7	Steering Positioning Pump Removal and Installation	05:30

4.10 Reference Documentation

The following list of reference material relates to this instruction. Additional specific documentation is referenced at each applicable step.



NOTE: The listed documentation must be available in valid version at the location where the job is being performed.

Manual	Reference
Safety Manual	Model Specific
Operation Manual	Model Specific
Service/Maintenance Manual	Model Specific
Mining and Rock Excavation Torque Specification	Document ID : TIS0006283 en-US
Spare Parts Catalog	Machine Specific (per serial number)
Environmental Instructions	Model Specific Safety Manual

5 Removing the Steering Positioning Pump

5.1 Prepare and Position the Machine

1. Align the machine in position.
2. Apply the parking brake.
3. Stop the machine.
4. Attach safety locks and tags to the machine in accordance with the site-specific procedures.
5. Block the wheels with wheel chocks according to local regulations.



NOTE: Extra requirements can apply. Refer to local regulations.

6. Install the articulation lock bar (Figure 1, item A) to the pins on the machine frames.

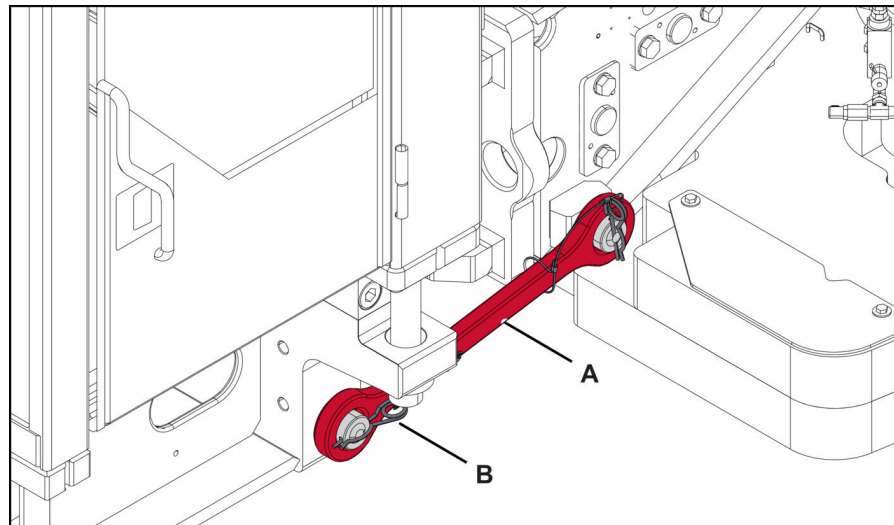


Figure 1

A	Articulation lock bar	B	Locking clip
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7. Insert the locking clips (item B) to secure the articulation lock bar (item A) with the pins.

8. **WARNING**

Accidental Movements

Can cause serious injury or death.

- ▶ Make sure that no one is at danger or hazard zone before you start or operate the machine.

Extend the front jack support legs fully from the jack beam and lower the jacks on to the ground (Figure 2).

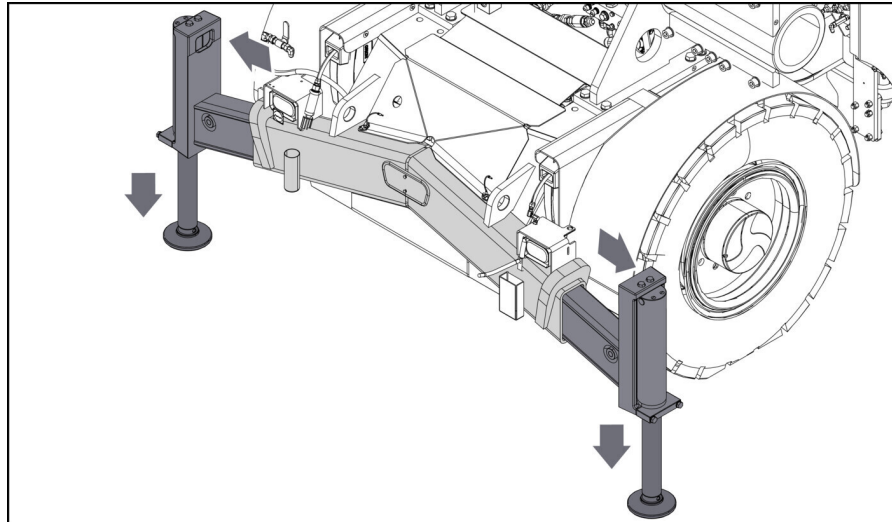


Figure 2

9. Lower the rear jacks onto the ground (Figure 3).



NOTE: Observe the spirit level in the canopy to make sure that the machine is level.

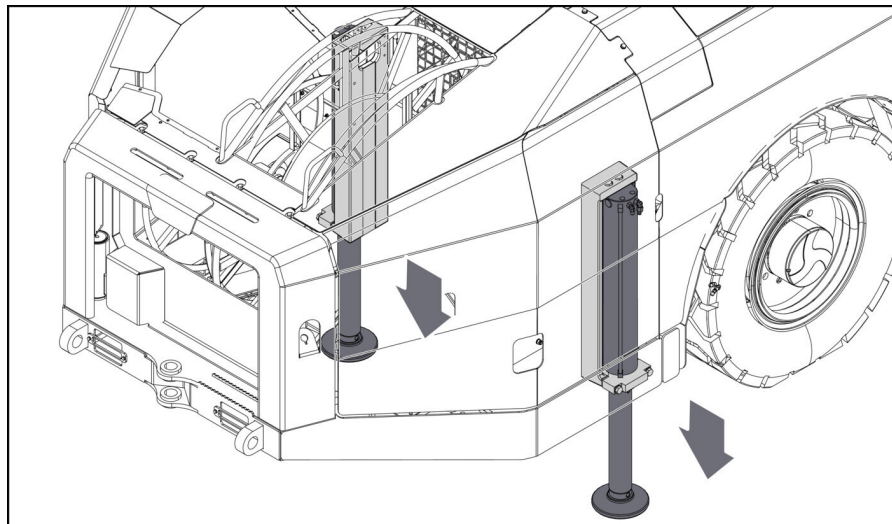


Figure 3

10.

WARNING

Heavy Components

Lifting the heavy components by hand can cause body or muscle strains.

- ▶ Position the body accordingly to support the weight of the component.

Place maintenance stands in the approved areas (Figure 4).

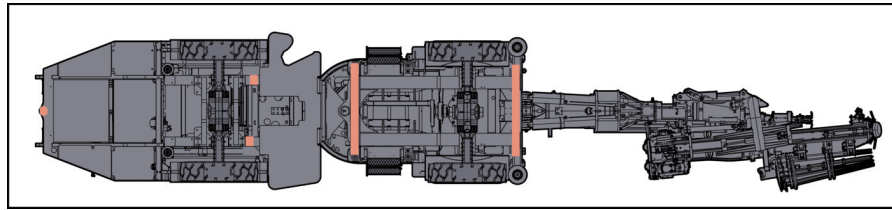


Figure 4

11. Lower the machine to the maintenance stands and secure as per local requirements.
12. Place the drill boom in center position and as low as possible (Figure 5).

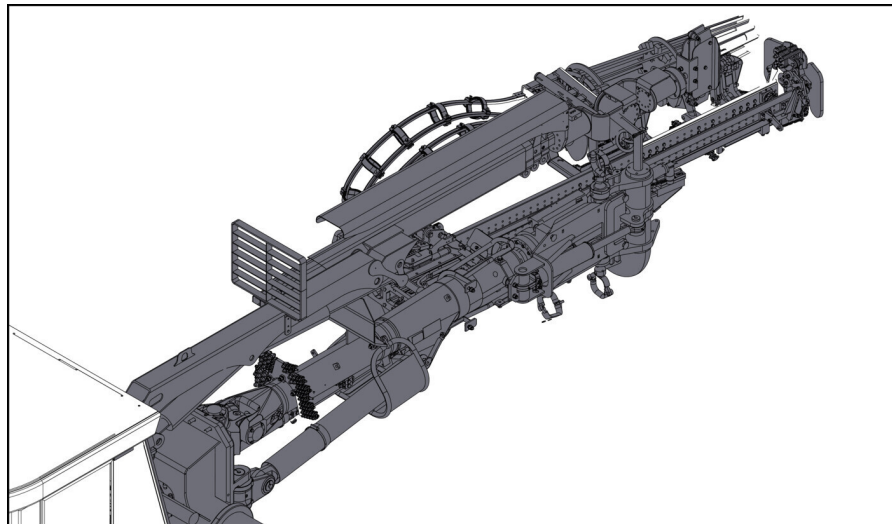


Figure 5

13. Stop the engine.
14. Set the battery isolation switch to the OFF position.
15. Attach safety locks and tags to the machine in accordance with the site-specific procedures.
- 16.

⚠ WARNING

High-Pressure System

Working with pressurized systems can cause personal injury.

- ▶ Do not do the maintenance work when you operate the machine.
- ▶ Make sure that the hydraulic, water, and air systems are depressurized before you start to work on these systems.
- ▶ Put on the applicable gloves.

Release the stored energy from the hydraulic brake system.



NOTE: Make sure that there is no pressure in the system.

17. Release the stored energy from the hydraulic oil tank and system.



NOTE: Make sure that there is no pressure in the system.

18. Release the stored energy from the air tank and system.



NOTE: Make sure that there is no pressure in the system.

19. Remove the breather filter cap (Figures 6A and 6B, item A) from the hydraulic oil tank.

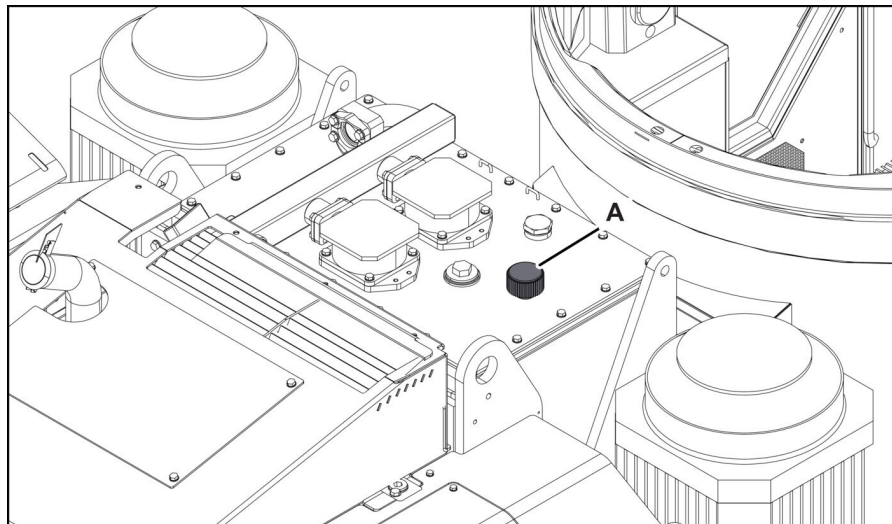


Figure 6A For Boltec M, E, EC, Simba M6C,E7C, Boomer M1D, Cabletec M,E and LC Machines

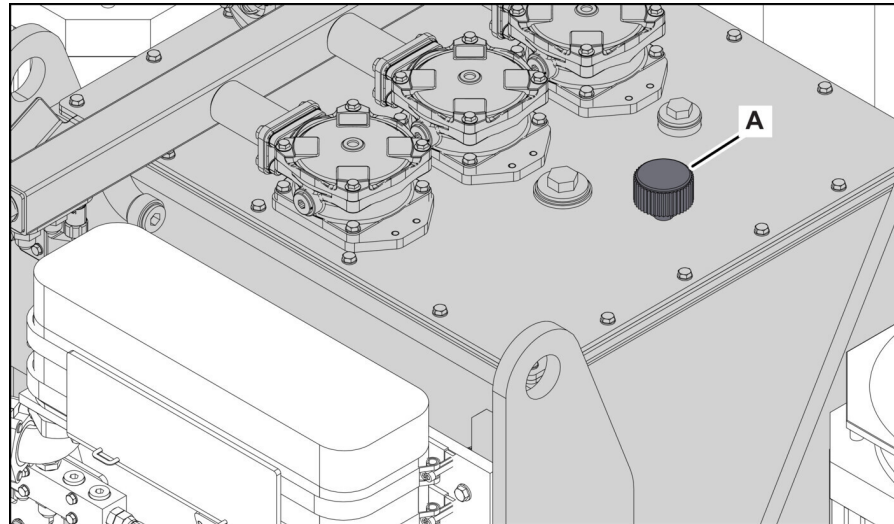


Figure 6B For Boomer E2C Machine

A	Breather filter cap		
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20. Connect a vacuum pump to the breather filter location to avoid wastage of hydraulic oil when disconnecting the hydraulic hoses.

5.2 Isolation of the Component

1.

⚠ WARNING

Slipping Hazard

Fluid leaks or spills can cause personal injury.

 - ▶ Cover all of the open ports.
 - ▶ Wipe off any spilled fluid immediately.

Put a container or oil absorbent material below the transmission area to collect the oil leaks when you disconnect the hoses.

2. Start the vacuum pump.

!

NOTE: Some oil remains in all of the hoses. Remove the hose connections with caution.

3.

⚠ WARNING

High Pressure

Residual pressure can cause personal injury.

 - ▶ Loosen the fittings carefully to release the pressure fully before you disconnect and cap the hoses.

Clean, label, and disconnect the hydraulic hoses (Figure 7, item A) from the gear pump. Plug the hoses and cap the ports immediately.

!	NOTE: Remove the fittings with caution, as there is residual oil in all hoses.
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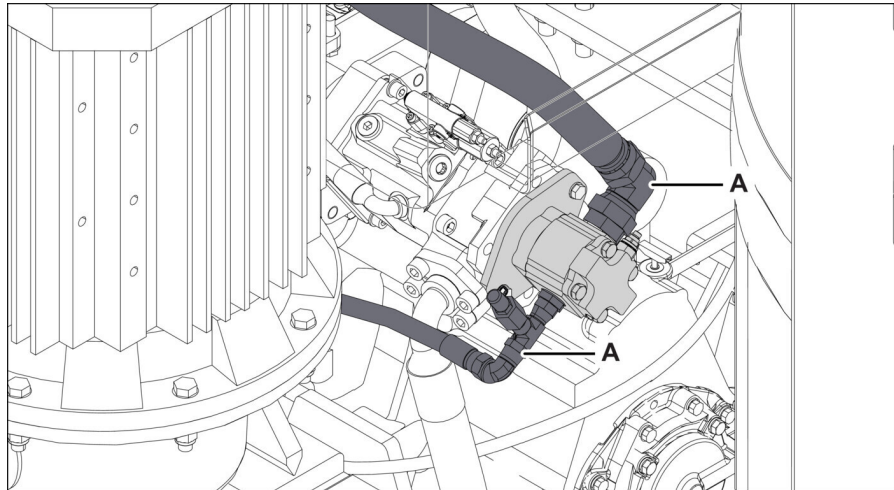


Figure 7

A	Hydraulic hose		
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- Remove the screws (Figure 8, item A) and the washers (item B) from the flange halves that attach the hydraulic hose (item C) to the steering positioning pump. Discard the hardware.

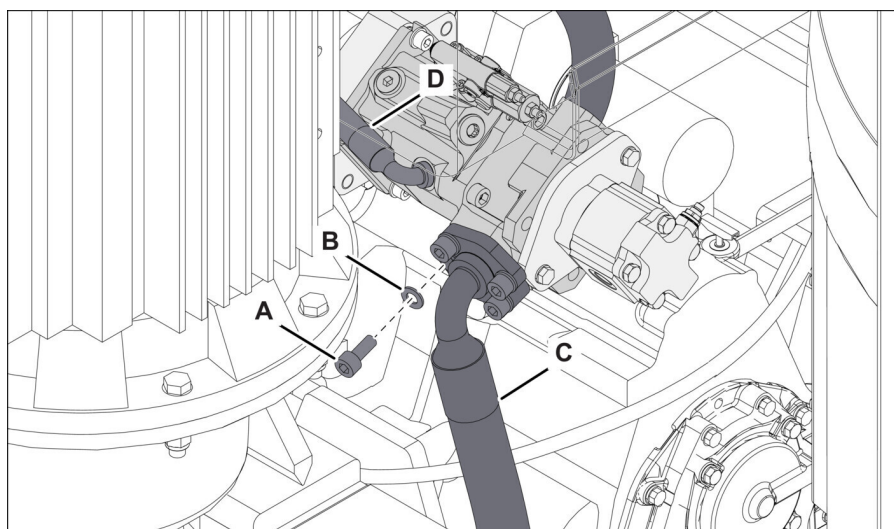


Figure 8

A	Screw	B	Washer
C	Hydraulic hose	D	Hydraulic hose

- Remove the flanges halves from above the hydraulic hose (item C). Put them in a safe location.

- Clean, label, and disconnect the hydraulic hoses (items C and D) from the steering positioning pump. Plug the hoses and cap the ports immediately.



NOTE: Remove the fittings with caution, as there is residual oil in all hoses.

- Stop the vacuum pump.

8.

CAUTION

Environmental Contaminant

Oil is an environmental contaminant and must be discarded correctly.

- ▶ Do not let the used oil drain onto the ground.
- ▶ Discard the used oil in accordance with local environmental regulations.

Remove the container or an oil absorbent materials from below the transmission area.

9.

WARNING

Heavy Components

Lifting the heavy components by hand can cause body or muscle strains.

- ▶ Position the body accordingly to support the weight of the component.

Remove the screws (Figure 9, item A) and the washers (item B) that attach the gear pump to the steering positioning pump.

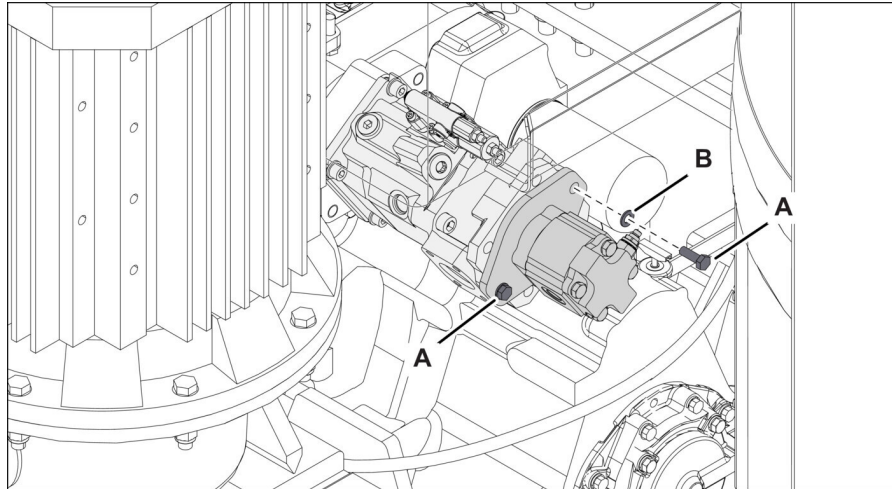


Figure 9

A	Screw	B	Washer
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10. Remove the gear pump (Figure 10, item A) away from the steering positioning pump and place it in a safe location.

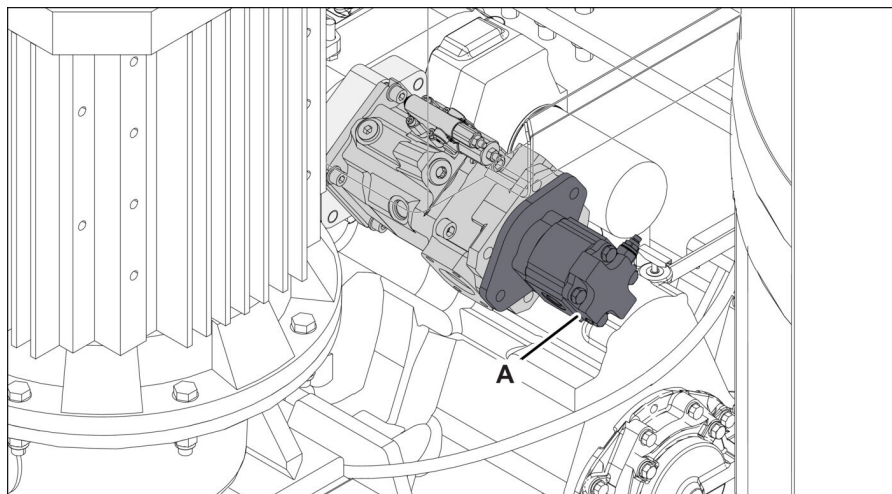


Figure 10

A	Gear pump		
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5.3 Lifting and Removal

1.

WARNING

Crushing Hazard

Can cause personal injury.

- ▶ Lifting equipment must be adequately sized, have the correct lifting capacity, and be in good condition.
- ▶ Be careful when you lift heavy components.

Attach an approved lifting device to the steering positioning pump (Figure 11, item A)

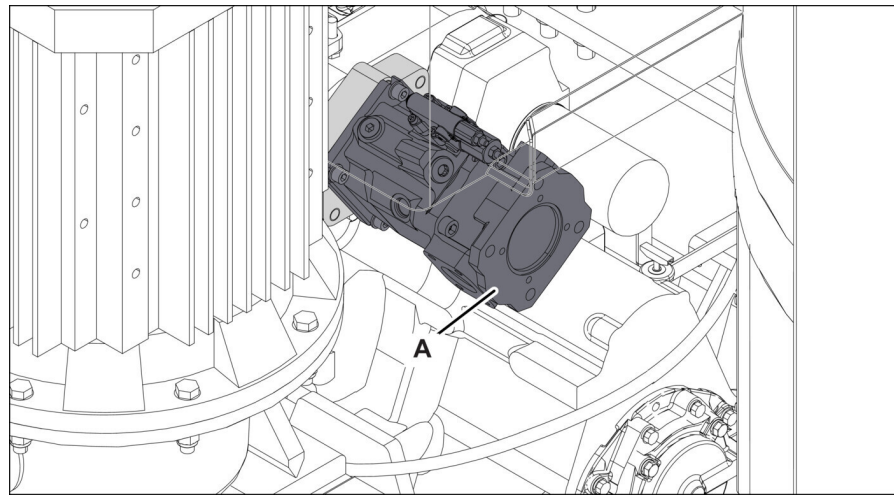


Figure 11

A	Steering positioning pump		
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2. Remove the screws (Figure 12, item A) and the washers (item B) that attach the steering positioning pump to the transmission. Discard the hardware.



NOTE: Make sure that the pump is securely supported or lifted before removing the mounting screws.

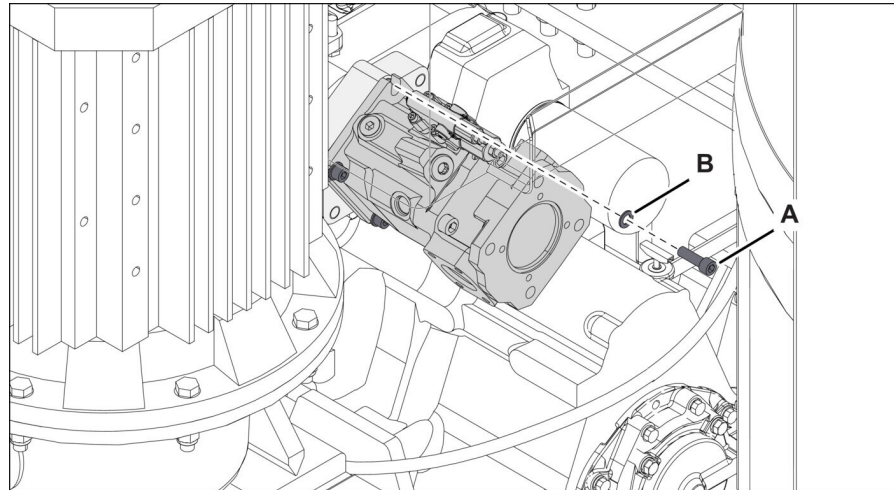


Figure 12

A	Screw	B	Washer
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3.

WARNING

Crushing Hazard

Unexpected movement of parts can cause personal injury or death.

- ▶ Do not put any part of your body on the object when lifting, moving, or lowering it.
- ▶ Do not go in, reside, or put body parts below unsecured, moveable, or lifted parts.
- ▶ Do not put hands and fingers in the pinch point areas when installing or tightening the parts.
- ▶ Stay away from moving parts.

Lift and remove the steering positioning pump (Figure 13, item A) from the transmission and put it in a safe location. Discard the O-rings.



NOTE: *Inspect the shaft and coupling for any damage.*

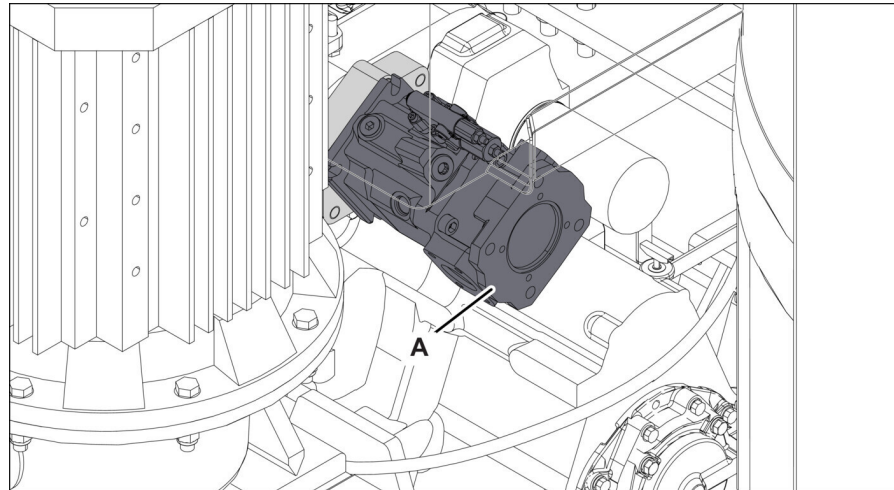


Figure 13

A	Steering positioning pump		
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4. Transfer all necessary fittings from the old pump to the new one.



NOTE: Plug all the open ports on the old pump to avoid any leaks.

5. Remove the lifting device from the steering positioning pump.
6. Put a tag on the battery isolation switch indicating that the steering positioning pump has been removed.

6 Installing the Steering Positioning Pump set

6.1 Prepare and Position the Machine

1. Make sure that the machine is isolated and, if necessary, isolate the machine with the battery isolation switch.

6.2 Lifting and Installation

1. Lubricate the shaft and couplings in the gear pump and in the steering positioning pump.



NOTE: Make sure that the O-rings are installed.

2.



WARNING

Crushing Hazard

Can cause personal injury.

- ▶ Lifting equipment must be adequately sized, have the correct lifting capacity, and be in good condition.
- ▶ Be careful when you lift heavy components.

Attach an approved lifting device to the steering positioning pump.

3.



WARNING

Crushing Hazard

Unexpected movement of parts can cause personal injury or death.

- ▶ Do not put any part of your body on the object when lifting, moving, or lowering it.
- ▶ Do not go in, reside, or put body parts below unsecured, moveable, or lifted parts.
- ▶ Do not put hands and fingers in the pinch point areas when installing or tightening the parts.
- ▶ Stay away from moving parts.

Lift and align the steering positioning pump (Figure 14, item A) in position on the transmission with the attached lifting device.

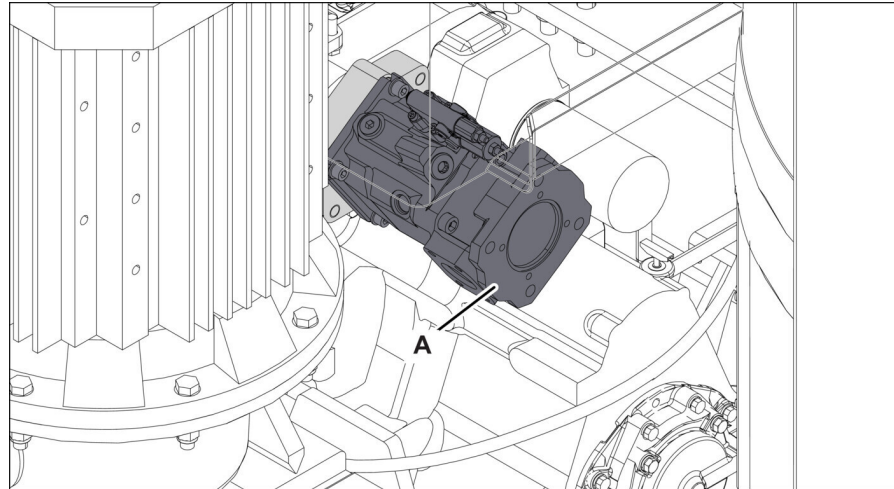


Figure 14

A	Steering positioning pump		
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NOTE: Bleed the pump as per instructions in machine-specific maintenance manual.

4. Insert the screws (Figure 15, item A) and the washers (item B) to attach the steering positioning pump to the transmission.

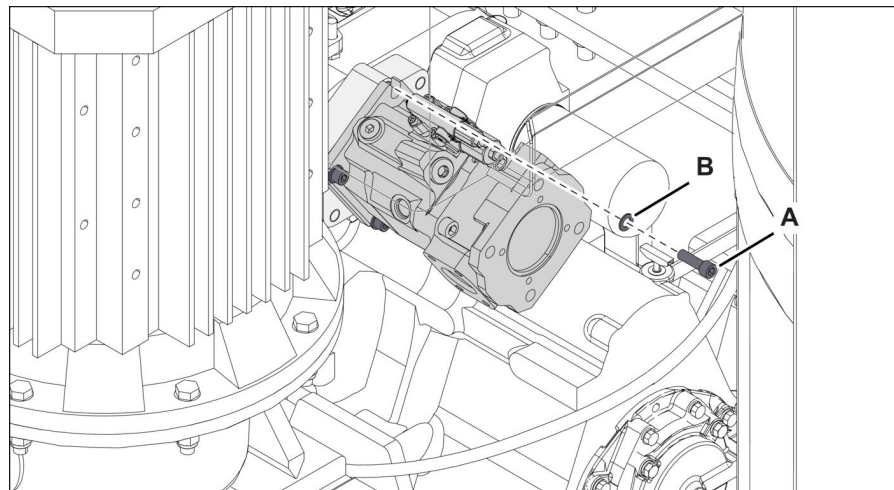


Figure 15

A	Screw	B	Washer
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5. Torque the screws to 69 Newton meters (51 foot-pounds) dry.
6. Remove the approved lifting devices from the steering positioning pump.

7.

⚠ WARNING**Heavy Components**

Lifting the heavy components by hand can cause body or muscle strains.

- ▶ Position the body accordingly to support the weight of the component.

Lift and align the gear pump (Figure 16, item A) in position to the steering positioning pump.



NOTE: Make sure that the O-ring is installed.



NOTE: Check the orientation marking of the pump.

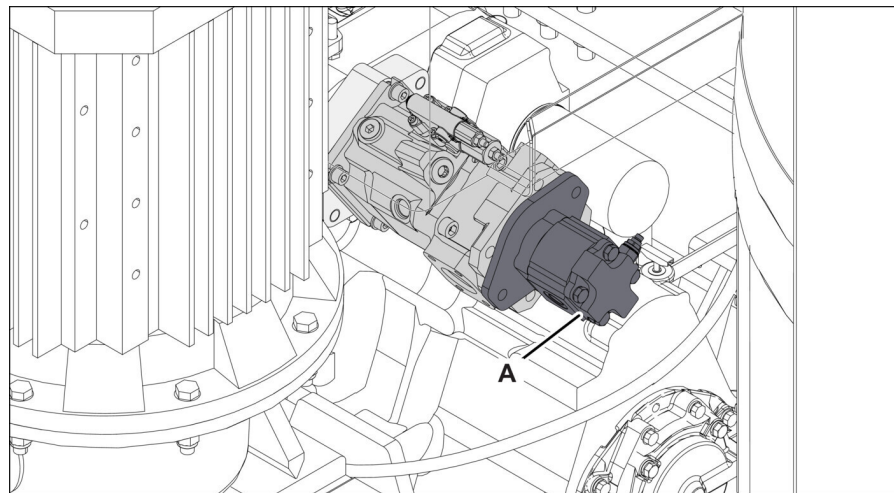


Figure 16

A	Gear pump		
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8.

⚠ WARNING**Pinch Points**

Can cause serious injury.

- ▶ Keep hands and fingers away from the moving parts during removal and installation of the component.
- ▶ Put on the applicable Personal Protective Equipment (PPE).

Insert the screws (Figure 17, item A) and washers (item B) to attach the gear pump to the steering positioning pump.

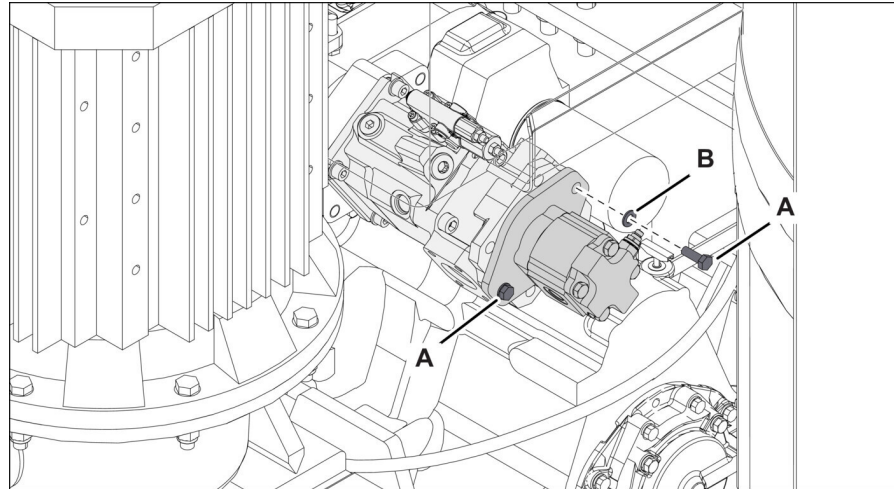


Figure 17

A	Screw	B	Washer
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9. Torque the screws to 69 Newton meters (51 foot-pounds) dry.

6.3 Preparation of the Component

1. **⚠ WARNING**
Slipping Hazard
 Fluid leaks or spills can cause personal injury.
 - ▶ Cover all of the open ports.
 - ▶ Wipe off any spilled fluid immediately.

Put a container or oil absorbent materials under the transmission area to collect oil leaks when you connect the hoses.

2. Start the vacuum pump.

3. Connect the hydraulic hoses (Figure 18, items C and D) to the steering positioning pump.

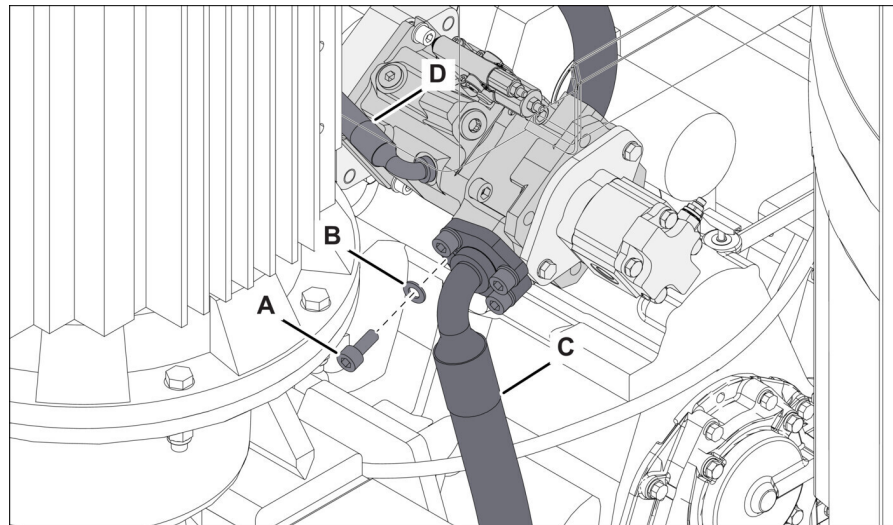


Figure 18

A	Screw	B	Washer
C	Hydraulic hose	D	Hydraulic hose

4. Put the flange halves in position onto the hydraulic hose (item C).
5. Install the washers (item B) and insert the screws (item A) to attach the flange halves on the hydraulic hose.
6. Torque the screws to 69 Newton meters (51 foot-pounds) dry.
7. Connect the hydraulic hoses (Figure 19, item A) to the gear pump.

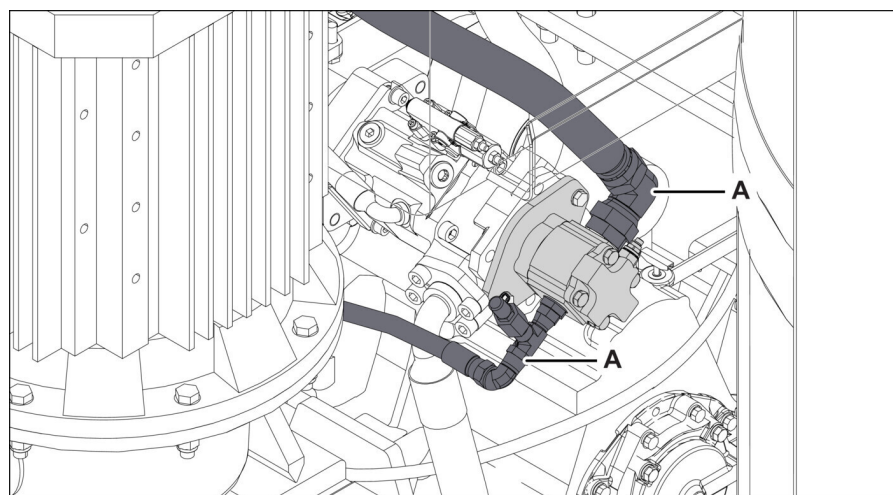


Figure 19

A	Hydraulic hose		
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8. Stop the vacuum pump and remove it from the machine.

9.

WARNING

High-Pressure System

Working with pressurized systems can cause personal injury.

- ▶ Do not do the maintenance work when you operate the machine.
- ▶ Make sure that the hydraulic, water, and air systems are depressurized before you start to work on these systems.
- ▶ Put on the applicable gloves.

Install the breather filter cap (Figures 20A and 20B, item A) to the hydraulic tank.

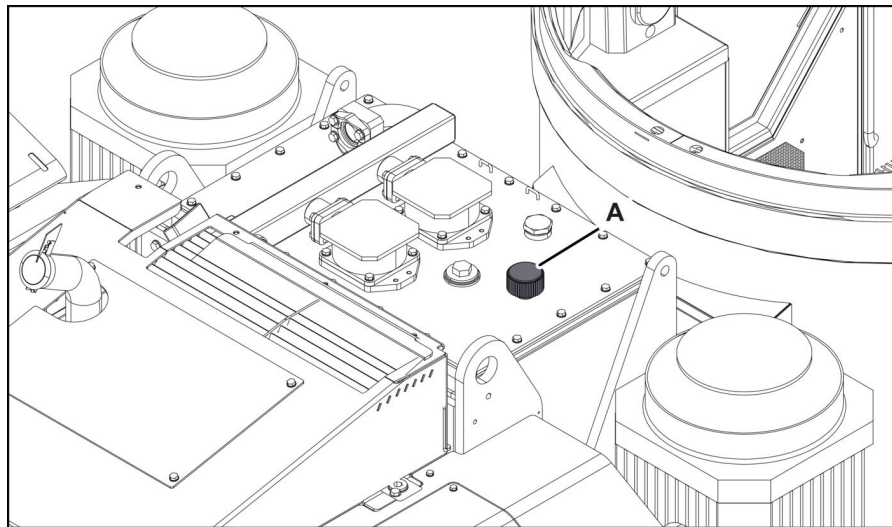


Figure 20A For Boltec M, E, EC, Simba M6C,E7C, Boomer M1D, Cabletec M,E and LC Machines

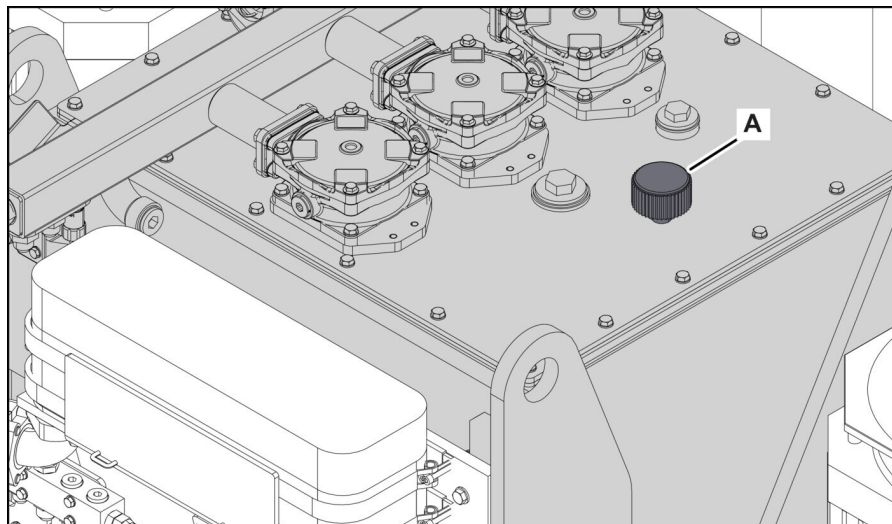


Figure 20B For Boomer E2C Machine

A	Breather filter cap		
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10.

 **CAUTION****Environmental Contaminant**

Oil is an environmental contaminant and must be discarded correctly.

- ▶ Do not let the used oil drain onto the ground.
- ▶ Discard the used oil in accordance with local environmental regulations.

Remove the container or oil absorbent material from below the transmission area.

11.

 **WARNING****Heavy Components**

Lifting the heavy components by hand can cause body or muscle strains.

- ▶ Position the body accordingly to support the weight of the component.

Remove the maintenance stands from below the machine.

12.

 **WARNING****Energized Machine**

Can cause serious injury.

- ▶ The machine must be fully energized and the engine must be switched on to complete this procedure.
- ▶ Be careful around moving parts and pinch points.

Inform the supervisor, lead hand, and all other persons who are concerned of the intent to restart the machine for testing purposes.



NOTE: Make sure that all personnel and bystanders are clear of the machine before start-up.

13. Remove the safety locks and tags from the machine in accordance with the site-specific procedures.

14. Set the battery isolation switch to the ON position.

15.

⚠ WARNING**Energized Machine**

Can cause personal injury to the surrounding people.

- ▶ Warn the surrounding people that the machine is about to be started and operated.

Start the machine.

16. Retract the front and rear support legs to lower the machine onto the ground (Figures 21A and 21B).

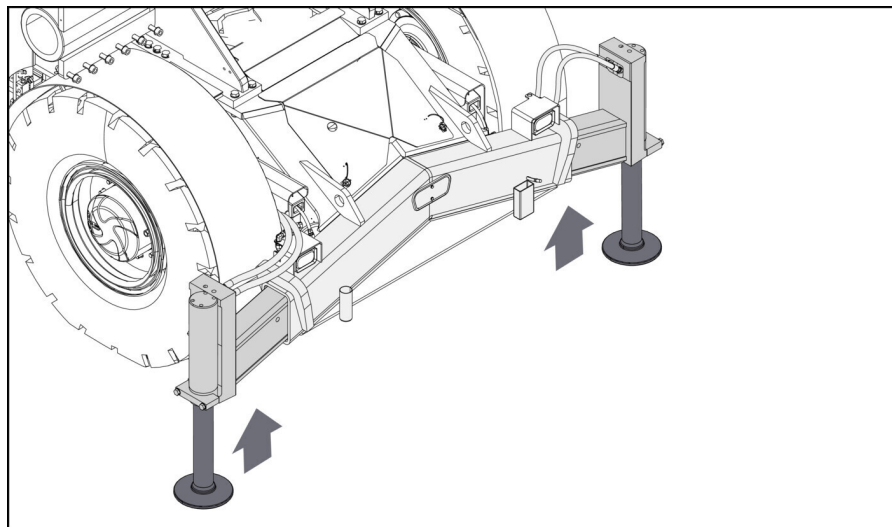


Figure 21A

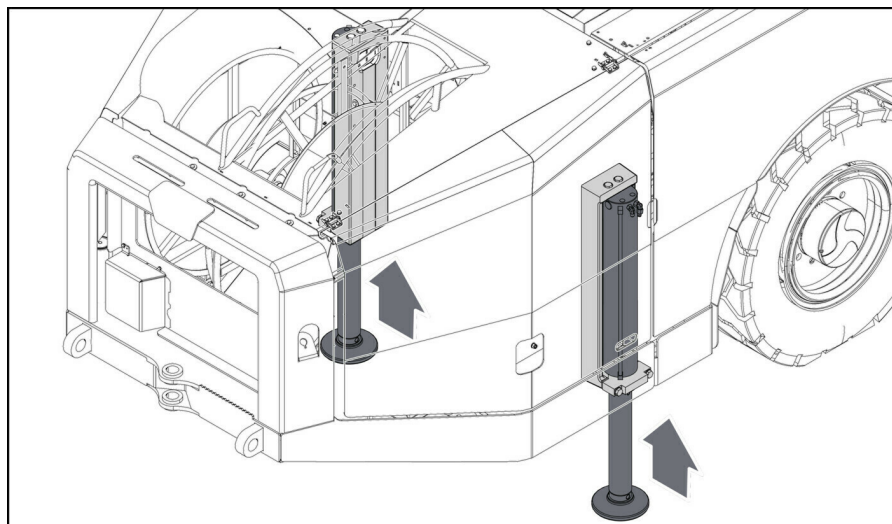


Figure 21B

17. Retract the front jack support legs fully into the jack beam (Figure 22).

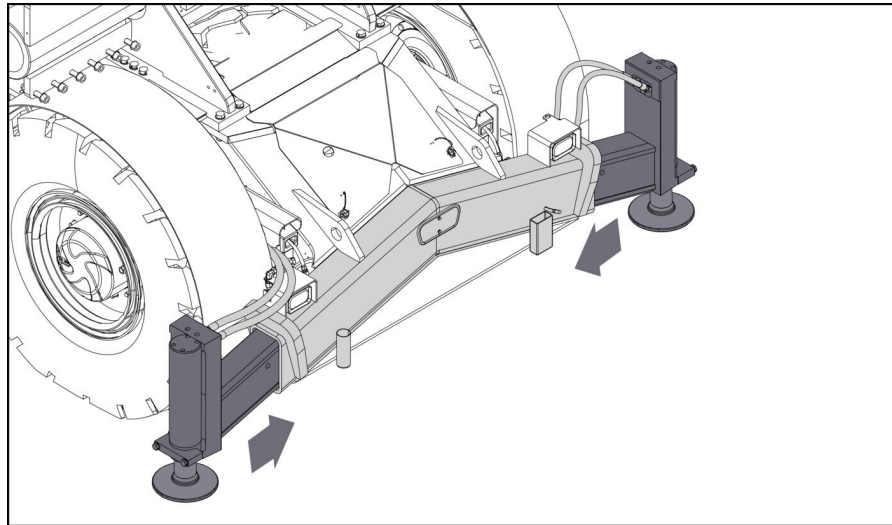


Figure 22

18. Stop the machine.
19. Set the battery isolation switch to the OFF position.
20. Put a tag on the battery isolation switch indicating that the steering positioning pump has been replaced.

7 Testing the Steering Positioning Pump Operation



NOTE: After completing the installation section of this instruction, the component is installed but possibly not ready to operate. A trained machine specialist must proceed with a commissioning start-up procedure to make sure that the machine system status is correct for start-up and all machine safety and functional requirements are met. Refer to the machine-specific manuals for information about machine start-up requirements.



NOTE: Make sure that the work area is clean, free of unwanted material, and tools are returned to the designated locations.



NOTE: The machine must be isolated when doing any repairs or adjustments during testing.

- Precondition
- ✓ The hydraulic tank oil level has been checked as per procedure.
 - ✓ The steering positioning pump has been bled as per procedure.

1.

WARNING

Energized Machine

Can cause serious injury.

- ▶ The machine must be fully energized and the engine must be switched on to complete this procedure.
- ▶ Be careful around moving parts and pinch points.

Inform the supervisor, lead hand, and all other persons who are concerned of the intent to restart the machine for testing purposes.



NOTE: Make sure that all personnel and bystanders are clear of the machine before start-up.

2. Do the hydraulic tank oil level check.



NOTE: Refer to Check Oil level in Carrier Hydraulic Tank in the Maintenance manual.

3. Remove the articulation lock bar.

4. Remove the safety locks and tags from the machine in accordance with the site-specific procedures.
5. Set the battery isolation switch to ON position.

6.

 **WARNING**

Accidental Movements

Can cause serious injury or death.

- ▶ Make sure that no one is at danger or hazard zone before you start or operate the machine.

 **WARNING**

Risk of Hearing Damage

Loud noise can cause hearing damage to personnel.

- ▶ Always use approved hearing protection.

Start the engine.

7. Do a functional check on pumps.
8. Check for abnormal noise coming from the pumps.
9. Stop the engine and isolate the machine using the battery isolation switch.
10. Attach safety locks and tags to the machine in accordance with the site-specific procedures.
11. Do an oil leak check around the pumps.
12. Do an oil leak check of the hose connections at the pumps.
13. Repair the leaks, if observed.

9 Procedure Report

Use the report to document all of the installation specifications such as torques and pressures.

The report must be completed, signed, and stored to use as a record, if settings or installation conditions requires verification. Include photos where necessary.

9.1 Machine / Component Details

Service Order Number:

Machine Model:

Machine Number:

Machine Serial Number:

Machine Hours:

Component Model:

Component Serial Number:

Technician Name:

Technician Signature:

9.2 Task Specifications

Use this section to record installation specifications such as torques and pressures.

Ref. Step	Installation Step Description	Value
	Lifting and Installation	
5	Steering positioning pump mounting screws	
9	Gear pump mounting screws	

